The operative time it takes to reconstruct the pericardium is not significant, and the diaphragmatic reconstruction is not facilitated in our experience by leaving the pericardium in.

Finally, we agree that personal experience with chylothorax should guide each surgeon as to whether prophylactic thoracic duct ligation should be used routinely.

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Technique for microsphere injection

To the Editor:

We read with great interest the article by Hedayati and associates[1] recently published in the *Journal*. The authors suggested that axillary artery cannulation for cardiopulmonary bypass is cerebroprotective from aortic atheroemboli by using canine models. We respectfully would like to note some procedural inconsistencies that might have lead to bias in the authors' conclusions.

The authors assessed the distribution of microspheres simulating aortic atheroemboli shed by patients during cardiopulmonary bypass. However, the microsphere injection method was inconsistent (eg, the pump flow was not constant, and the rate of microsphere injection was unclear), and the reference blood withdrawal rate for calculating tissue blood flow was unclear. Because the distribution pattern of the microspheres can be influenced easily by the pump flow rate, microsphere injection rate, shape of the aorta, and location of the injection, more precise experimental protocols might affect this study's results.

One more point of concern in this study is the size of the microspheres. Small microspheres (15 μm in diameter) have been used for measuring tissue blood flow,[2] and large microspheres (>50 μm in diameter) have been used for creating microemboli[3] by several investigators. Hedayati and associates[1] used microspheres 15 μm in diameter; however, they did not use the microspheres to measure tissue blood flow but rather as microemboli in this study. Because atheroemboli are generally larger than 15 μm in diameter and because size affects the degree of cerebral ischemia and infarction,[4] we believe that the larger microsphere should have been used to analyze the risk of atheroemboli in the aorta during cardiopulmonary bypass.

In light of these considerations, the authors' conclusion that "axillary artery cannulation for cardiopulmonary bypass is cerebroprotective" cannot be fully supported on the basis of the data presented. More studies with larger microspheres or flow characterization with both particle image velocimetry and laser Doppler velocimetry could provide more meaningful results and insights on this subject to further understand this clinically important topic.

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Reply to the Editor:

Thank you for your interest in our publication entitled "Axillary artery cannulation for cardiopulmonary bypass reduces cerebral microemboli." We are confident that our conclusion, that axillary cannulation reduces cerebral microemboli, is supported by our experimental evidence. We apologize for any lack of clarity with our experimental design. We agree that the distribution pattern of the microspheres might be influenced by the pump flow rate, microsphere injection rate, shape of the aorta, location of the injection, and location of the cardiopulmonary bypass cannulation site. Using each animal as its own control enabled us to provide constant conditions for each variable, with the only difference being the cannulation site.

Our microsphere injection method was consistent for each animal. The only variable was the cannulation site for cardiopulmonary bypass. The pump flow rate was constant during the 2 cannulation techniques within each animal, although the pump rate did vary from 1.9 to 3.4 $L \cdot min^{-1} \cdot m^{-2}$ among animals to maintain constant pressure among animals. Five million microspheres (2.5×10^6 microspheres/mL) were injected over 1 minute.

Larger microspheres have been used to induce infarction or ischemia and might have been preferred if that was our intention. We were exclusively interested in the distribution of the spheres and found no evidence that the distribution of 50-μm spheres would have, in our model, altered our impressive results. Atheroemboli range in size, with the most numerous being the smallest.[1] We used 15-μm spheres, as has been done before in similar investigations.[2]

We agree with your suggestion that further characterization of the flow pattern through particle-imaging techniques will provide additional evidence as to the superior ability of axillary cannulation to provide cerebroprotection, and we plan to do so in the future to further corroborate the vastly reduced stroke rate we have observed when axillary perfusion was used in our patients with high-risk aortas.

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Carbodissection of the internal thoracic artery

To the Editor:

I write with reference to the article by Özkan and associates titled "A Carbon Dioxide Insufflation Technique for Prepara-